FAIRCHILD SEMICONDUCTOR®

April 2013

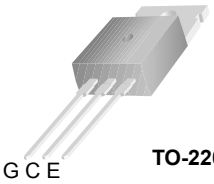
SGP23N60UF
600V PT IGBT

General Description

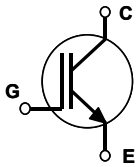
Fairchild®'s UF series IGBTs provide low conduction and switching losses. UF series is designed for the applications such as general inverters and PFC where High Speed Switching is required feature.

Features

- 12 A, 600 V, T_C = 100°C
- Low Saturation Voltage: V_{CE}(sat) = 2.1 V @ I_C = 12 A
- Typical Fall Time. . . . . .220ns at T_J = 125°C
- High Input Impedance



TO-220



Applications

General Inverter, PFC

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Absolute Maximum Ratings

T_C = 25°C unless otherwise noted

Symbol	Description		SGP23N60UF	Unit
V_{CES}	Collector-Emitter Voltage		600	V
V_{GES}	Gate-Emitter Voltage		± 20	V
I_C	Collector Current	@ T_C = 25°C	23	A
	Collector Current	@ T_C = 100°C	12	A
$I_{CM\ (1)}$	Pulsed Collector Current		92	A
P_D	Maximum Power Dissipation	@ T_C = 25°C	100	W
	Maximum Power Dissipation	@ T_C = 100°C	40	W
T_J	Operating Junction Temperature		-55 to +150	°C
T_{stg}	Storage Temperature Range		-55 to +150	°C
T_L	Maximum Lead Temp. for Soldering Purposes, 1/8" from Case for 5 Seconds		300	°C

Notes :
(1) Repetitive rating : Pulse width limited by max. junction temperature

Thermal Characteristics

Symbol	Parameter	Typ.	Max.	Unit
$R_{\theta JC}$	Thermal Resistance, Junction-to-Case	--	1.2	°C/W
$R_{\theta JA}$	Thermal Resistance, Junction-to-Ambient	--	62.5	°C/W

Electrical Characteristics of the IGBT

T_C = 25°C unless otherwise noted

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
Off Characteristics						
BV_{CES}	Collector-Emitter Breakdown Voltage	V_{GE} = 0V, I_C = 250uA	600	--	--	V
$\Delta B_{VCES}/\Delta T_J$	Temperature Coefficient of Breakdown Voltage	V_{GE} = 0V, I_C = 1mA	--	0.6	--	V/°C
I_{CES}	Collector Cut-Off Current	V_{CE} = V_{CES}, V_{GE} = 0V	--	--	250	uA
I_{GES}	G-E Leakage Current	V_{GE} = V_{GES}, V_{CE} = 0V	--	--	± 100	nA
On Characteristics						
$V_{GE(th)}$	G-E Threshold Voltage	I_C = 12mA, V_{CE} = V_{GE}	3.5	4.5	6.5	V
$V_{CE(sat)}$	Collector to Emitter Saturation Voltage	I_C = 12A, V_{GE} = 15V	--	2.1	2.6	V
		I_C = 23A, V_{GE} = 15V	--	2.6	--	V
Dynamic Characteristics						
C_{ies}	Input Capacitance	V_{CE} = 30V, V_{GE} = 0V, f = 1MHz	--	720	--	pF
C_{oes}	Output Capacitance		--	100	--	pF
C_{res}	Reverse Transfer Capacitance		--	25	--	pF
Switching Characteristics						
$t_{d(on)}$	Turn-On Delay Time	V_{CC} = 300 V, I_C = 12A, R_G = 23Ω, V_{GE} = 15V, Inductive Load, T_C = 25°C	--	17	--	ns
t_r	Rise Time		--	27	--	ns
$t_{d(off)}$	Turn-Off Delay Time		--	60	130	ns
t_f	Fall Time		--	70	150	ns
E_{on}	Turn-On Switching Loss		--	115	--	uJ
E_{off}	Turn-Off Switching Loss		--	135	--	uJ
E_{ts}	Total Switching Loss		--	250	400	uJ
$t_{d(on)}$	Turn-On Delay Time	V_{CC} = 300 V, I_C = 12A, R_G = 23Ω, V_{GE} = 15V, Inductive Load, T_C = 125°C	--	23	--	ns
t_r	Rise Time		--	32	--	ns
$t_{d(off)}$	Turn-Off Delay Time		--	100	200	ns
t_f	Fall Time		--	220	250	ns
E_{on}	Turn-On Switching Loss		--	205	--	uJ
E_{off}	Turn-Off Switching Loss		--	320	--	uJ
E_{ts}	Total Switching Loss		--	525	800	uJ

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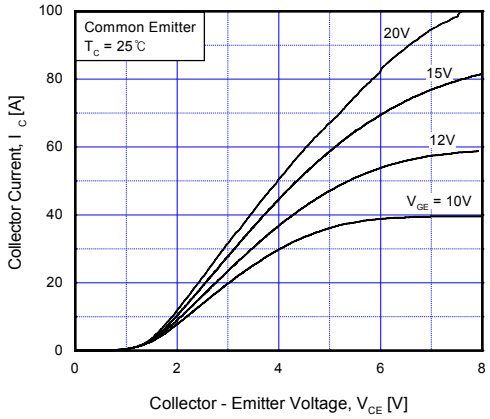


Fig 1. Typical Output Characteristics

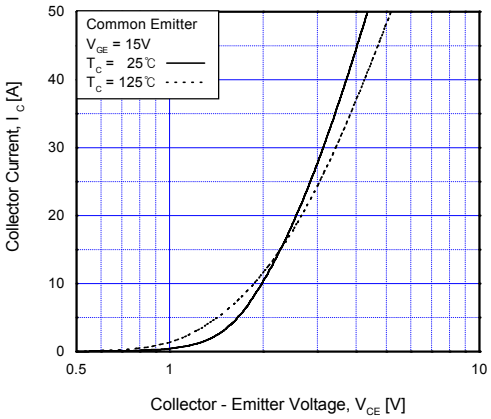


Fig 2. Typical Saturation Voltage Characteristics

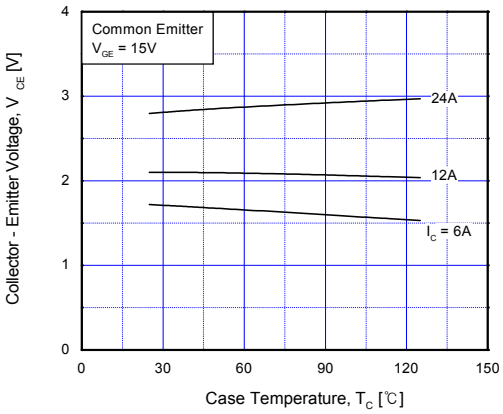


Fig 3. Saturation Voltage vs. Case Temperature at Variant Current Level

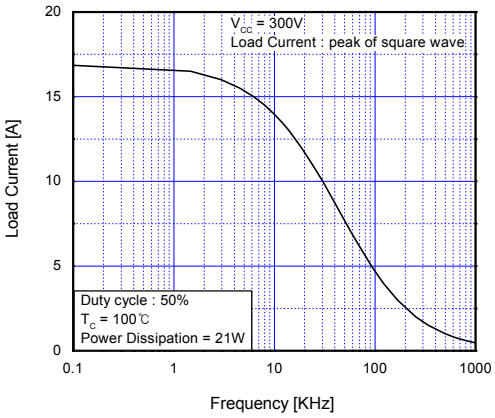


Fig 4. Load Current vs. Frequency

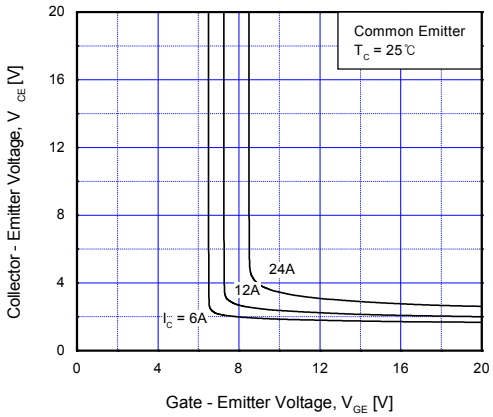


Fig 5. Saturation Voltage vs. V_{GE}

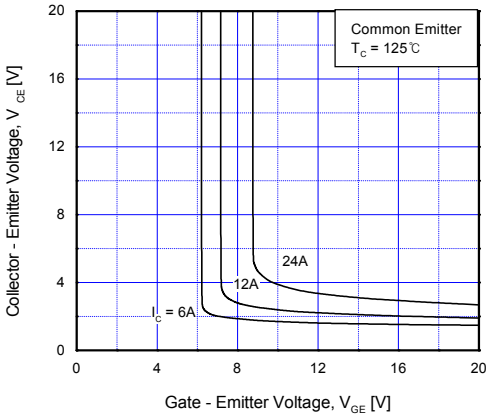


Fig 6. Saturation Voltage vs. V_{GE}

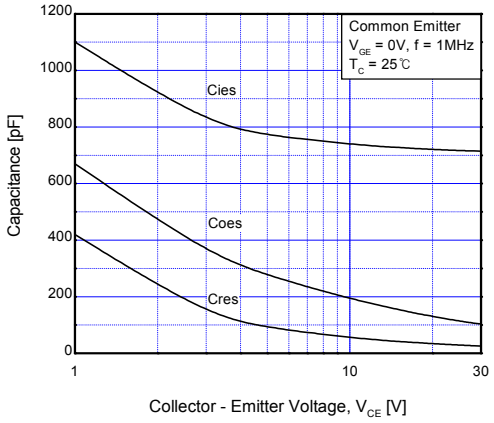


Fig 7. Capacitance Characteristics

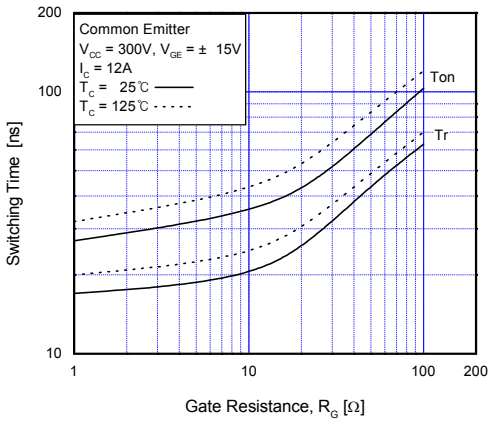


Fig 8. Turn-On Characteristics vs. Gate Resistance

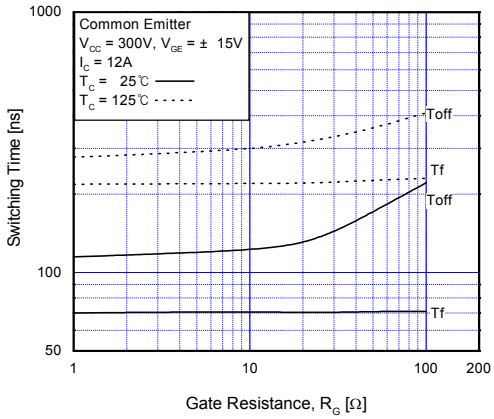


Fig 9. Turn-Off Characteristics vs. Gate Resistance

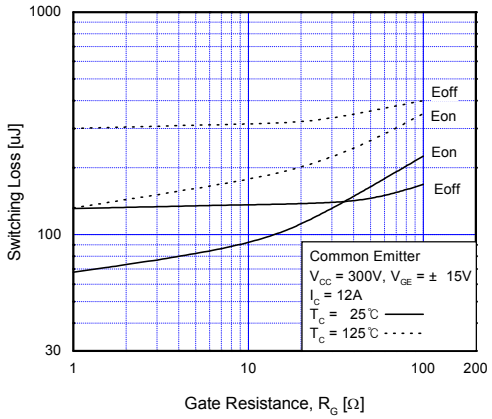


Fig 10. Switching Loss vs. Gate Resistance

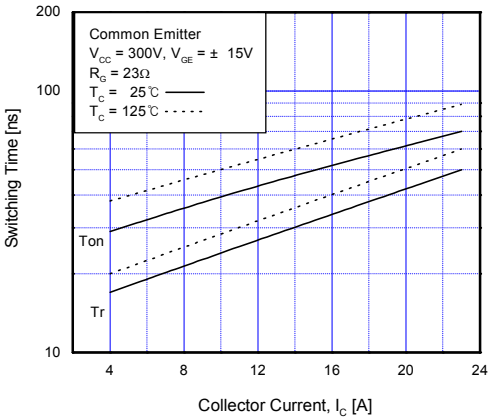


Fig 11. Turn-On Characteristics vs. Collector Current

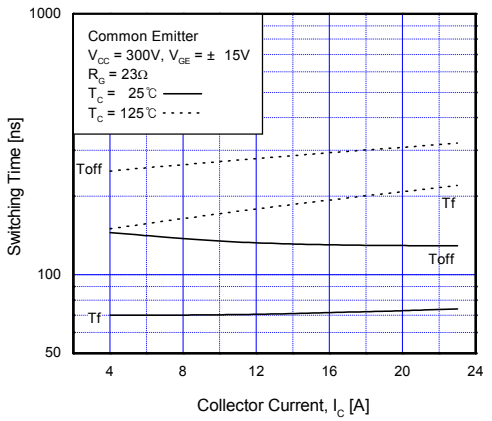


Fig 12. Turn-Off Characteristics vs. Collector Current

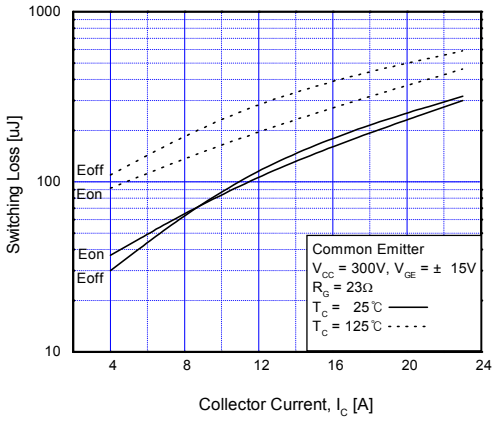


Fig 13. Switching Loss vs. Collector Current

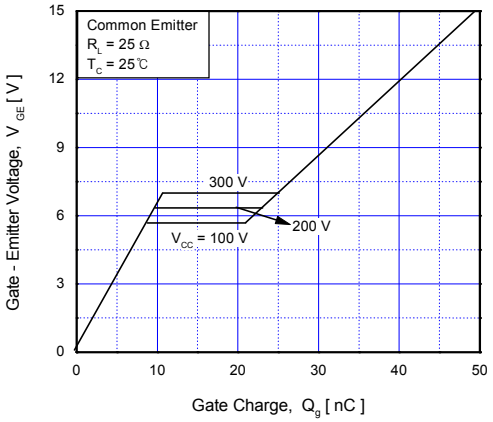


Fig 14. Gate Charge Characteristics

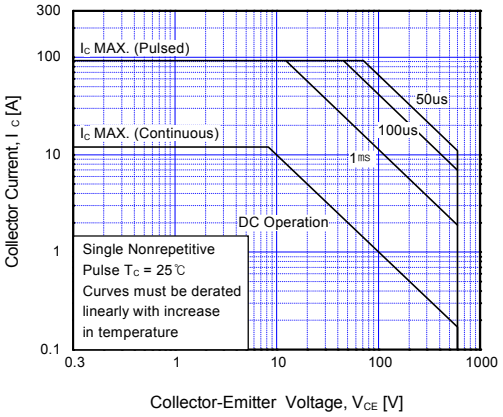


Fig 15. SOA Characteristics

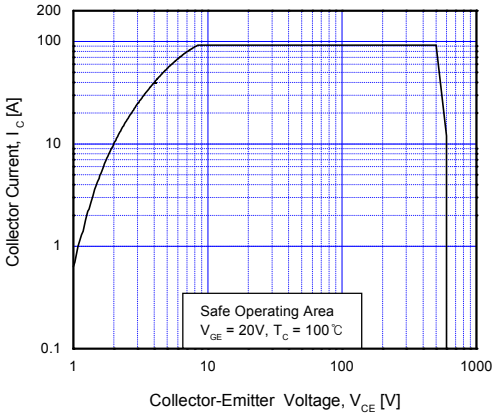


Fig 16. Turn-Off SOA Characteristics

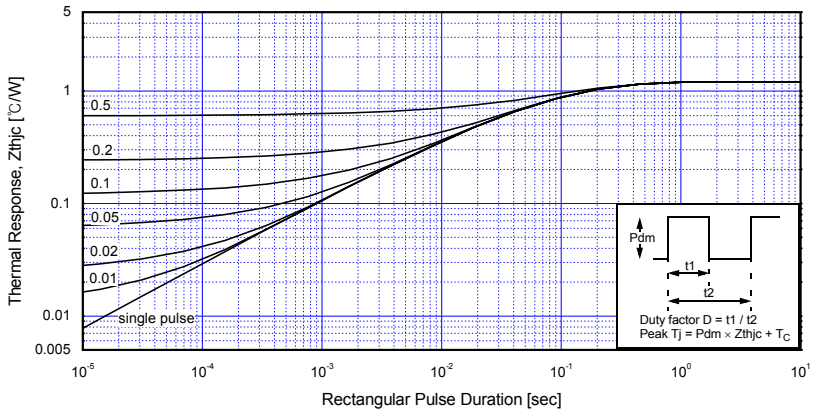
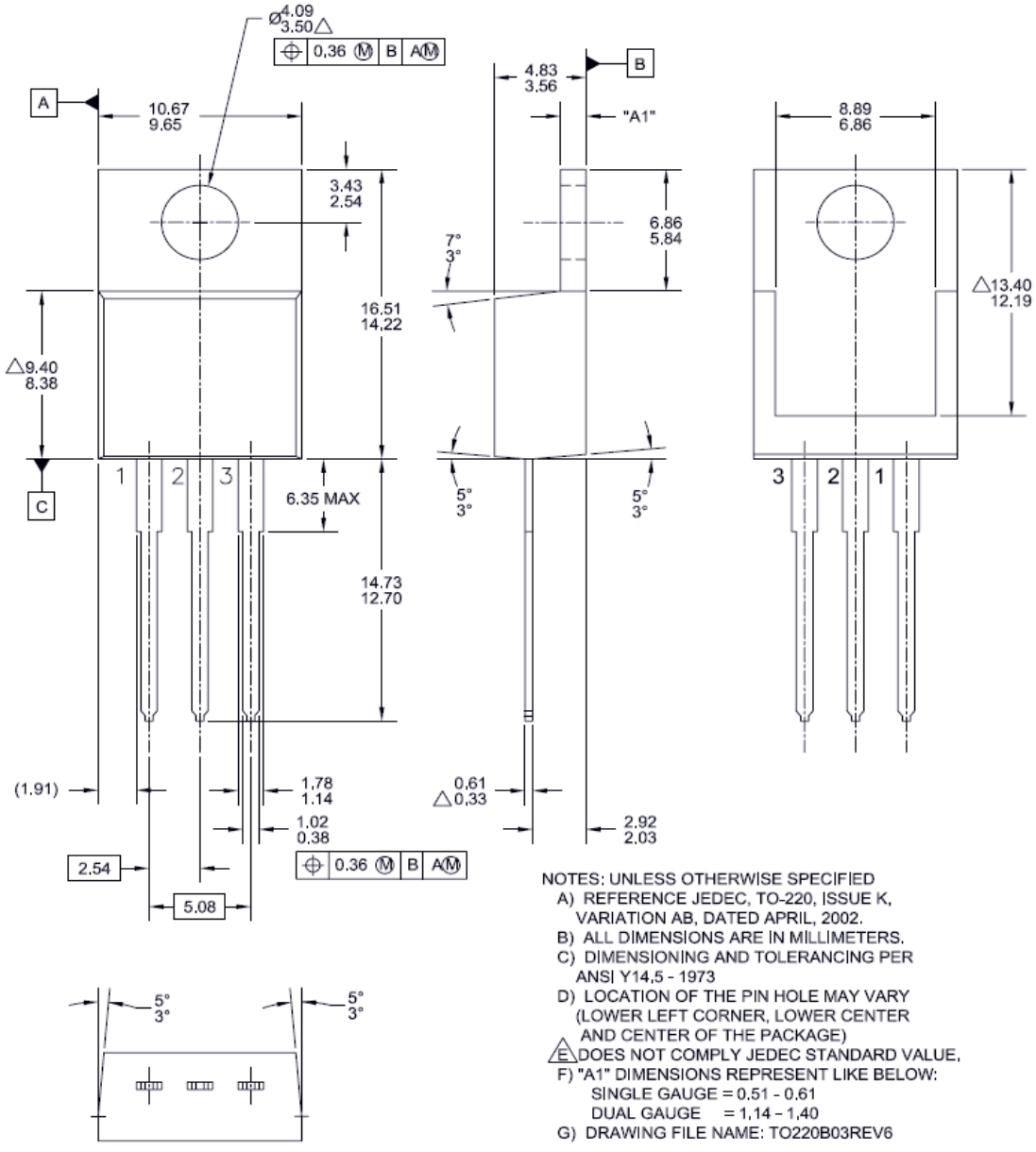


Fig 17. Transient Thermal Impedance of IGBT

Mechanical Dimensions

TO-220B03



NOTES: UNLESS OTHERWISE SPECIFIED
A) REFERENCE JEDEC, TO-220, ISSUE K, VARIATION AB, DATED APRIL, 2002.
B) ALL DIMENSIONS ARE IN MILLIMETERS.
C) DIMENSIONING AND TOLERANCING PER ANSI Y14.5 - 1973
D) LOCATION OF THE PIN HOLE MAY VARY (LOWER LEFT CORNER, LOWER CENTER AND CENTER OF THE PACKAGE)
△E DOES NOT COMPLY JEDEC STANDARD VALUE,
F) "A1" DIMENSIONS REPRESENT LIKE BELOW:
SINGLE GAUGE = 0.51 - 0.61
DUAL GAUGE = 1,14 – 1,40
G) DRAWING FILE NAME: TO220B03REV6

Dimensions in Millimeters

FAIRCHILD SEMICONDUCTOR®

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2. A critical component in any component of a life support, device, or system whose failure to perform can be reasonably expected to cause the failure of the life support device or system, or to affect its safety or effectiveness.

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Datasheet Identification	Product Status	Definition
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Preliminary	First Production	Datasheet contains preliminary data; supplementary data will be published at a later date. Fairchild Semiconductor reserves the right to make changes at any time without notice to improve design.
No Identification Needed	Full Production	Datasheet contains final specifications. Fairchild Semiconductor reserves the right to make changes at any time without notice to improve the design.
Obsolete	Not In Production	Datasheet contains specifications on a product that is discontinued by Fairchild Semiconductor. The datasheet is for reference information only.

Rev. I64